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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/992,560	11/05/2001	Kenneth E. Gonsalves	46872-257422	5242

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EXAMINER	
LEE, SIN J	

ART UNIT	PAPER NUMBER
1752	

DATE MAILED: 03/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/992,560	GONSALVES, KENNETH E.	
	Examiner	Art Unit	
	Sin J. Lee	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11,14,17,19-55,57-59,62,65-71,75-79 and 81-83* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11,14,17,19-21,65-71,75-79 and 81-83* is/are allowed.

6)☒ Claim(s) *22-55,57-59 and 62* is/are rejected.

7)☒ Claim(s) *33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicants canceled claims 6, 7, 15, 16, 18, 56, 74, and 80.

2. In view of applicants' amendment of December 29, 2004, the previous objections on claims 18, 25, 28, 46, 47, 48, and 81 (as addressed in Paragraphs 10-16 of the last Office action mailed on November 2, 2004) are hereby withdrawn.

3. In view of applicants' amendment of December 29, 2004, previous 35 USC 112 rejection on claim 56 (as addressed in Paragraph 17 of the last Office action) is hereby withdrawn.

4. In view of applicants' amendment of December 29, 2004, the following rejections are hereby withdrawn: previous 102(b) rejection on claims 6 and 7 over Ito et al'021 (Paragraph 19 of the last Office action), previous 102(b) rejection on claims 6 and 7 over Kita et al (JP'881) (Paragraph 20 of the last Office action), previous 102(e) rejection on claim 6 over Takamuki'725 (Paragraph 21 of the last Office action), previous 102(e) rejection on claim 6 over Kita et al'717 (Paragraph 22 of the last Office action), previous 102(b) rejection on claims 14-17, 19, 20, 22, 23, 25, 26, 28, 30, 31, 34, 35, 37, 74-76, 79, 81, and 82 over Gonsalves et al (Paragraph 23 of the last Office action), previous 102(a) rejection on claims 6, 7, 14, 15, 17, 19-21, 74-78, and 80-82 over Hu et al (Paragraph 24 of the last Office action), previous 102(b) rejection on claims 22-27, 30-32, 35, and 37 over Wu et al (Paragraph 25 of the last Office action), previous 102(b) rejection on claims 22-24, 26, and 27 over Pyun et al (Paragraph 26 of the last Office action), previous 102(b) rejection on claims 38, 39, 47, 51, 52, 57, and 59 over Matsuo et al'325 (Paragraph 27 of the last Office action), previous 102(a) rejection

on claims 38, 42, 43, 47, 48, 51, 55, and 62 over Wu et al (Paragraph 28 of the last Office action), previous 103(a) rejection on claim 34 over Wu et al in view of Moran et al'664 (Paragraph 30 of the last Office action), previous 103(a) rejection on claims 30-32, 35, and 37 over Pyun et al in view of Wu et al (Paragraph 31 of the last Office action), previous 103(a) rejection on claim 34 over Pyun et al in view of Wu et al and further in view of Moran et al'664 (Paragraph 32 of the last Office action), previous 103(a) rejection on claim 57 over Wu et al in view of Kinoshita et al'210 (Paragraph 33 of the last Office action), and previous 103(a) rejection on claims 6, 7, 14-17, 19, 20, 74-79, 81 and 82 over Angelopoulos et al'084 in view of Haddad et al (Paragraph 34 of the last Office action).

5. **Due to newly cited prior arts, the following rejections are made *non-final*,** and the Examiner sincerely apologizes for any inconvenience caused by this.

Claim Interpretations

6. Based on the reading of present specification, present *polymeric* chemically amplified resist of claims 22-28 and 30-37 is interpreted by the Examiner to be *a polymer* that comprises (i) a repeat unit that contains a methacrylate component but does not contain a polyhedral oligosilsesquioxane moiety, (ii) a repeat unit that contains a polyhedral oligosilsesquioxane component and (iii) a repeat unit that contains a photoacid generating component.

7. Based on the reading of present specification, present *polymeric* chemically amplified resist of claims 38-48 and 51-59 is interpreted by the Examiner to be *a polymer* that comprises (i) a methacrylate component that does not comprise a

photoacid generating moiety, (ii) a photoacid generating component that does not comprises a styrene moiety.

The *polymeric* chemically amplified resist of present claims 40 and 53 were interpreted by the Examiner to be *a polymer* that comprises (i) a methacrylate component that does not comprise a photoacid generating moiety, (ii) a photoacid generating component that does not comprises a styrene moiety, and further comprises (iii) a dissolution promoting moiety within the same polymer.

The *polymeric* chemically amplified resist of present claim 44 is interpreted by the Examiner to be *a polymer* that comprises (i) a methacrylate component that does not comprise a photoacid generating moiety, (ii) a photoacid generating component that does not comprises a styrene moiety, and *further comprises* (iii) a polyhedral oligosilsesquioxane component within the same polymer.

Claim Objections

8. Claim 33 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 33 depends from claim 30, which in turn depends from claim 22. Present claim 22 requires the presence of the photoacid-generating component within the polymer. However, the polymer in claim 33 does not comprise any photoacid-generating component.

Claim Rejections - 35 USC § 102

9. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

10. Claims 22-49, 51-55, 57-59, and 62 are rejected under 35 U.S.C. 102(a) as being anticipated by Gonsalves et al ("High Resolution Resists for Next Generation Lithography: The Nanocomposite Approach", Materials Research Society Symposium Proceedings (2001), vol.636, pg.D6.5.1-D.6.5.12).

The polymer shown in Figure 8 (pg.D.6.5.9) of the prior art teaches present inventions of claims 22-24, 26 (it is the Examiner's position that the prior art's polymer in Figure 8 would inherently have the present range of Tg of present claim 26), 33, and 38-45. The polymer shown in Figure 8 also teaches present invention of claim 62.

With respect to present claims 25 and 46, the prior art teaches the wt% of the POSS component to be 17.3% (see Table IV – Sample #6). Therefore, the prior art teaches present invention of claims 25 and 46.

With respect to present claims 27, 28, 47, and 48, the polymer of Figure 8 has Mw of 1.70×10^5 and has PDI of 1.69 (see Sample #6 of Table IV). Therefore, the prior art teaches present inventions of claims 27, 28, 47, and 48.

With respect to present claims 30-32 and 51-55, the prior art states that a resist film that contains the polymer is case on silicon wafers. The resist is then exposed imagewise and then developed (see pg.D6.5.9). Therefore, the prior art teaches present inventions of claims 30-32 and 51-55. Furthermore, the prior art states (see the "Introduction" section on pg.D6.5.1) that within the next decade the microelectronic industry will require a lithographic process capable of mass-producing *integrated circuits*

with sub-70 nm critical dimensions. The prior art states that extreme UV, X-ray, electron beam and ion beam lithography therefore have become more promising candidates for next generation nanofabrication. Based on these statements, one of ordinary skill in the art would immediately envisage using extreme UV, electron beam, ion beam or X-ray radiation for the imagewise exposure step to produce integrated circuits with sub-70 nm critical dimensions. Therefore, the prior art teaches present inventions of claims 34-37 and 57-59.

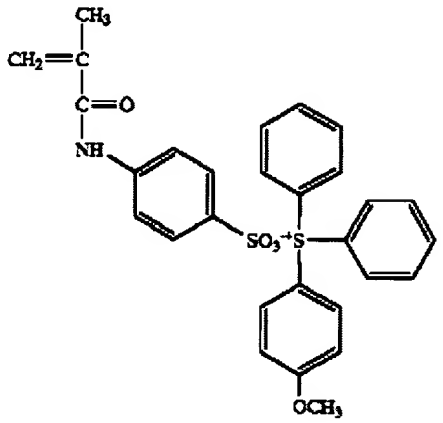
With respect to present claim 29, the polymer shown in Figure 5 teaches present invention of claim 29.

With respect to present claim 49, the prior art states in its abstract that resist systems based on POSS copolymerized with MMA, TBMA, MMA and a proprietary PAG are presented. Based on this teaching, one of ordinary skill in the art would immediately envisage a resist system based on POSS copolymerized with MMA, TBMA, MMA, and the PAG monomer shown in Figure 7 of the prior art. Therefore, the prior art teaches present invention of claim 49.

11. Claims 38-40, 42, 47, 51, 52, 55, and 57 are rejected under 35 U.S.C. 102(b) as being anticipated by Aoai et al (5,945,250).

Aoai teaches (see col.5, lines 20-28 and Table 1 in col.24) Resin (III-1), a sulfonium salt resin which generates a sulfonic acid, and the resin is made from the monomers of (VII-1), methacrylic acid, and benzyl methacrylate (see Table 1). The structure for the monomer (VII-1) is shown below (see col.19, lines 17-33);

(VII-7)



The resin has Mw of 37.4 X 10^3. Therefore, the prior art teaches present inventions of claims 38-40, 42, and 47.

Aoai teaches (col.89, lines 59-65) that a resist pattern can be obtained by applying his photosensitive composition on a substrate such as those for use in the production of precision *integrated-circuit* elements by an appropriate coating means, exposing the coating to light through a mask, and then baking and developing the coating. Therefore, the prior art teaches present inventions of claims 51, 52, 55, and 57.

12. Claims 38-40, 42, 51, 52, and 55 are rejected under 35 U.S.C. 102(b) as being anticipated by Aogo et al (JP 10-221852 and its Chem. Abstract (AN 1998:545694)).

The Japanese document has been submitted for full English translation. Only the Chem. Abstract is available at this time.

Aogo teaches a positive working photoresist composition comprising a resin having a repeat unit containing groups that decomposes upon irradiation *to generate acid*, a repeat unit containing alicyclic group, and a repeat unit that contains an acid-decomposable group (see the abstract). The composition provides high resolution

resist patterns with good profile independent of the elapse of time from exposure to post-bake. At the end of the abstract (see the last two pages) Aogo's polymer, that is made from the monomers of CH_2=C(Me)-C(=O)-O-C(Me)$_2$-CH_2Cl, CH_2=C(Me)-C(=O)-O-C_6H_{11}, *methacrylic acid*, and *CH_2=C(Me)-C(=O)-O-$(CH_2)_3$-$SO_3^-(Ph)_3S^+$*, is disclosed. Therefore, the prior art teaches present inventions of claims 38-40, 42, 51, 52, and 55.

Claim Rejections - 35 USC § 103

13. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

14. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gonsalves et al ("High Resolution Resists for Next Generation Lithography: The Nanocomposite Approach", Materials Research Society Symposium Proceedings (2001), vol.636, pg.D6.5.1-D.6.5.12) in view of Barclay et al (US 6,492,086 B1).

As explained above in Paragraph 10, Gonsalves teaches a resist system based on POSS copolymerized with MMA, TBMA, MMA, and [*p*-CH_2=C(CH_3)C(O)O$C_6H_4SMe_2$]OSO_2CF_3 (the PAG monomer shown in Figure 7 of the prior art). This resin does not include present itaconic anhydride monomer unit additionally. It is well known in the art to incorporate the monomer of itaconic anhydride into a polymer in order to enhance the dissolution of the polymer as evidenced by Barclay et al, col.10, lines 34-45. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the monomer of itaconic anhydride into Gonsalves's polymer (i.e., the polymer of POSS, MMA, TBMA, MMA, and [*p*-CH_2=C(CH_3)C(O)O$C_6H_4SMe_2$]OSO_2CF_3) in order to enhance the dissolution of the

polymer as taught by Barclay. Thus, Gonsalves in view of Barclay would render obvious present invention of claim 50.

15. Claims 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoai et al (5,945,250) in view of Barclay et al (US 6,492,086 B1).

As explained above in Paragraph 11, Aoai teaches a resin, which is made from the monomers of (VII-1), methacrylic acid, and benzyl methacrylate. Although Aoai's resin does not contain an itaconic anhydride monomer unit, it is well known in the art to incorporate the monomer of itaconic anhydride into a polymer in order to enhance the dissolution of the polymer as evidenced by Barclay et al, col.10, lines 34-45. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the monomer of itaconic anhydride into Aoai's polymer in order to enhance the dissolution of the polymer as taught by Barclay. Thus, Aoai in view of Barclay would render obvious present inventions of claims 53 and 54.

16. Claims 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aogo et al (JP 10-221852 and its Chem. Abstract (AN 1998:545694)) in view of Barclay et al (US 6,492,086 B1).

As explained above in Paragraph 12, Aogo teaches a polymer that is made from the monomers of CH_2=C(Me)-C(=O)-O-C(Me)$_2$-CH_2Cl, CH_2=C(Me)-C(=O)-O-C_6H_{11}, *methacrylic acid*, and *CH_2=C(Me)-C(=O)-O-$(CH_2)_3$-$SO_3^-(Ph)_3S^+$*. Although Aogo's polymer does not contain an itaconic anhydride monomer unit, it is well known in the art to incorporate the monomer of itaconic anhydride into a polymer in order to enhance the dissolution of the polymer as evidenced by Barclay et al, col.10, lines 34-45. Therefore,

it would have been obvious to one of ordinary skill in the art to incorporate the monomer of itaconic anhydride into Aogo's polymer in order to enhance the dissolution of the polymer as taught by Barclay. Thus, Aogo in view of Barclay would render obvious present inventions of claims 53 and 54.

Double Patenting

17. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

18. Claims 38, 39, 42, 43, 51, 52, 55, and 62 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 6, 10, 11, and 17 of copending Application No. 10/835,757. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the following reasons:

Claims 1 and 6 of App.'757 teach a chemically amplified resist comprising the polymerization product of a methacrylate component (such as methyl methacrylate, t-butyl methacrylate, methacrylic acid). Claims 10 and 11 of App.'757 teach that the chemically amplified resist of claim 1 further comprises the photoacid generator

component of [*p*-CH_2=C(CH_3)C(O)$OC_6H_4SMe_2$]OSO_2CF_3. Claim 17 of App.'757 teaches a lithographic process which employs a lithographic recording medium comprising the chemically amplified resist of claim 1. Therefore, claims 1, 6, 10, 11, and 17 of App.'757 teaches present inventions of claims 38, 39, 42, 43, 51, 52, 55, and 62.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

19. Claims 22-25, 29-33, 35-46, 49-55, 58, 59, and 62 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 5, 6, 8, 10-13, 18-20, 22, and 23 of copending Application No. 10/324,642. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the following reasons:

Claims 1 and 3 of App.'642 teach a nanocomposite resist polymer comprising a photoacid generating component of [*p*-CH_2=C(CH_3)C(O)$OC_6H_4SMe_2$]OSO_2CF_3. Claims 5 and 6 of App.'642 teach that the polymer of claim 1 further comprises a polyhedral oligosilsesquioxane component such as 3-(3,5,7,9,11,13, 15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate. Claims 10 and 11 of App.'642 teach that the polymer of claim 1 further comprises a methacrylate component such as methyl methacrylate, t-butyl methacrylate, methacrylic acid, *or "a combination thereof"*. Therefore, based on the teachings of those claims of App.'642, it would have been obvious to one of ordinary skill in the art to make a polymer comprising (i) a photoacid generating component of [*p*-

$CH_2=C(CH_3)C(O)OC_6H_4SMe_2]OSO_2CF_3$, (ii) a polyhedral oligosilsesquioxane component of 3-(3,5,7,9,11,13, 15-heptacyclopentylpentacyclo-$[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]$octasiloxane-1-yl)propyl methacrylate, and (iii) a methacrylate component which is a *combination* of methyl methacrylate, t-butyl methacrylate, and methacrylic acid with a reasonable expectation of obtaining a nanocomposite resist polymer. Claims 18-20, 22, and 23 of App.'642 teach a lithographic process which uses the nanocomposite resist polymer of claim 1 wherein the process if an extreme UV, X-ray, electron beam, and ion beam lithographic process. Therefore, teachings of App.'642 renders obvious present inventions of claims 22-24, 29-33, 35-39, 42-45, 49, 51, 52, 55, 58, 59, and 62.

Also, claims 12 and 13 of App.'642 teach that the polymer of claim 10 further comprises a dissolution promoter such as itaconic anhydride. Therefore, teachings of App.'642 renders obvious present inventions of claims 40, 41, 50, 53, and 54.

Claim 8 of App.'642 teach that the polymer contains about 3-20 wt.% of the polyhedral oligosilsesquioxane component. Therefore, teachings of App.'642 renders obvious present inventions of claims 25 and 46.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

36. Claims 11, 14, 17, 19-21, 65-71, 75-79, and 81-83 are allowed. None of the cited prior arts teaches or suggests present combination of polyhedral oligosilsesquioxane

and poly(α-chloroacrylate-*co*-α-methyl styrene) of claim 11 or claim 14 (*Gonsalves et al ,which is discussed above in Paragraph 10, teaches the combination of ZEP520 (poly(α-chloroacrylate-co-α-methyl styrene)) and nano-SiO_2 particles, which is not the same as the polyhedral oligosilsesquioxane*). None of the cited prior arts teaches or suggests present polyacetal polymer of claim 65 into which a polyhedral oligosilsesquioxane disilanol component is incorporated.

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. J. L.

S. Lee
March 19, 2005

Sin J. Lee

Sin J. Lee
Patent Examiner
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